

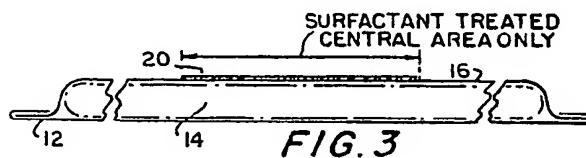
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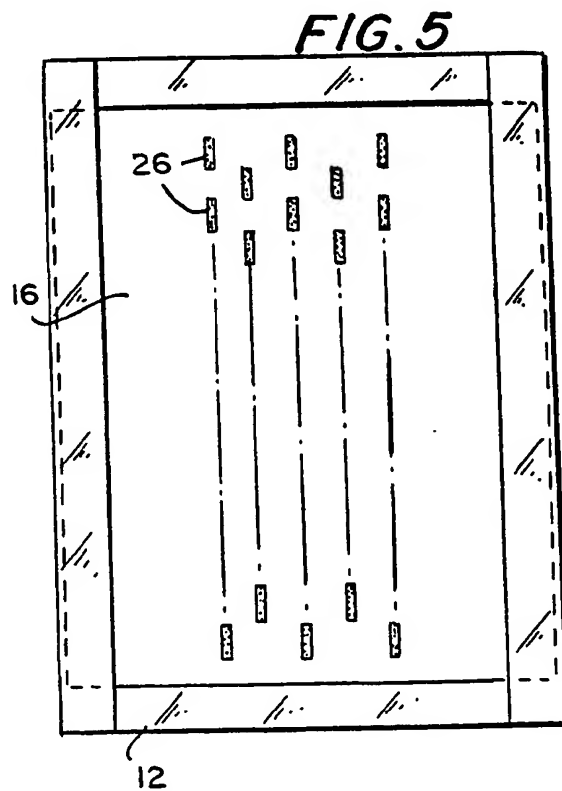
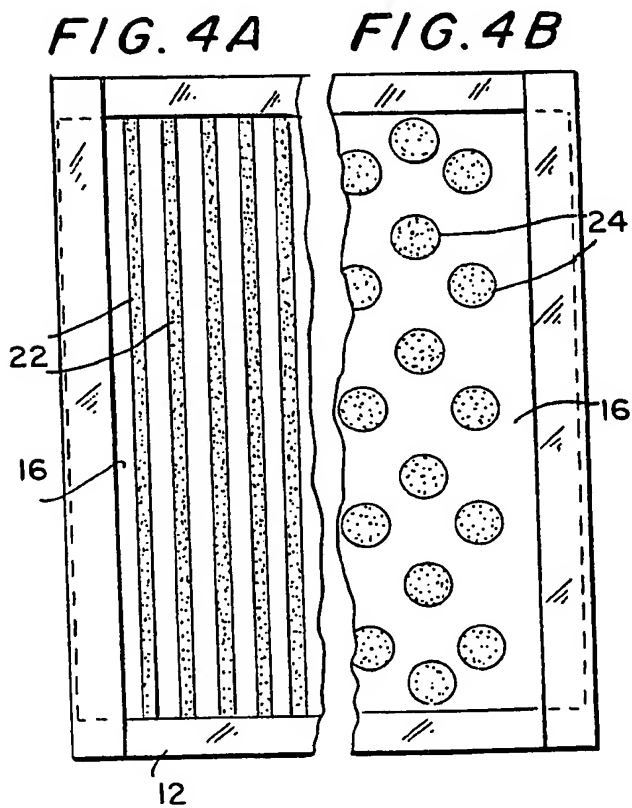
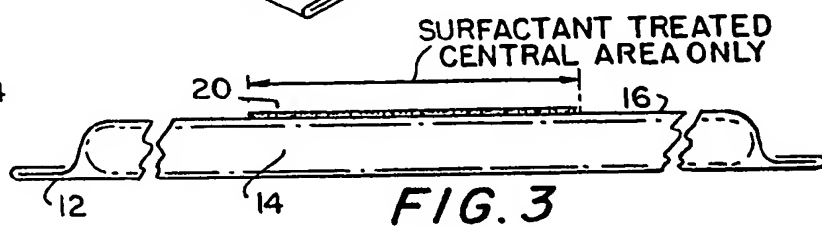
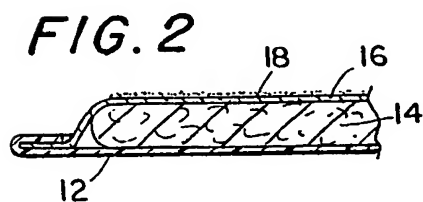
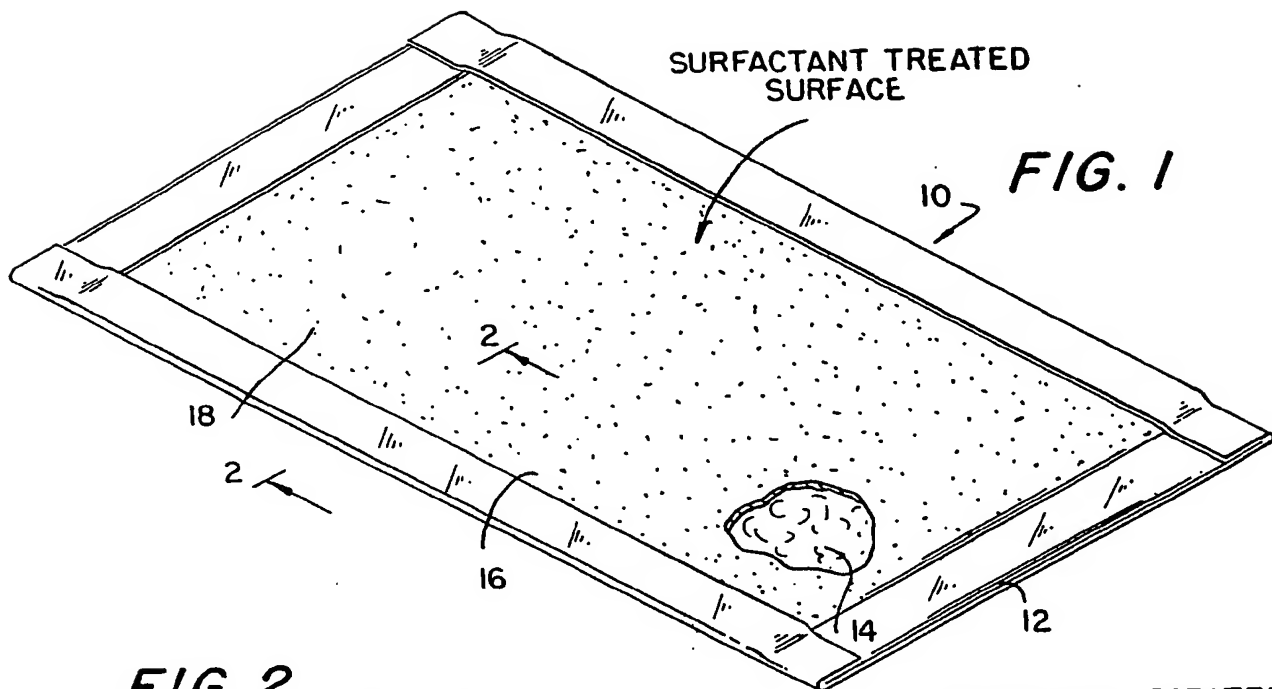
(54) Disposable diaper with improved top sheet

(57) A disposable product, such as a diaper, comprising an air permeable top layer (16) containing a major amount of non-woven hydrophobic fibres, from 0.1 to 0.6% by weight of a surfactant being applied to the said top sheet to facilitate fluid passage there-through, the said top sheet having a maximum wetback factor of 10, and a penetration factor of at least 80.

The surfactant is preferably non-ionic and uniformly impregnated onto the top sheet. The surfactant may be applied in spaced discrete areas, in lines or spots and is preferably applied only to the central area (20) of the top sheet (16).



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SPECIFICATION

Disposable diaper with improved top sheet

5 This invention relates to disposable products, such as diapers, sanitary napkins and underpads, and more particularly to the construction of the top sheet of such disposable products.

In the past disposable products and particularly
10 diapers, sanitary napkins and underpads, have been constructed with top sheets of hydrophobic material. This material has rather low fluid retention and fluid wetback characteristics. Improvements in fluid penetration are desirable to prevent leaking especially when there are rapid gushes of fluid such as urine or menstrual fluid. The hydrophobic sheets have in the past been made of non-woven polyamide, polypropylene or polyester fibres or mixtures thereof. United States Patent No. 3,814,101
15 shows the use of hydrophobic top sheet which is provided with a series of slits which serve as valves. This hydrophobic top sheet is of a film-like material.

Hydrophobic non-woven materials have been used in diaper construction, such as shown in United
20 States Patent No. 3,987,786 which employs the use of a surfactant in particular areas on treated materials.

The disposable products according to the present invention include an air permeable top sheet of
25 hydrophobic non-woven material, based on polyamide, polypropylene or polyester material or mixtures thereof, which overlies the absorbent pad which in turn is underlined by a water impervious film material. The top sheet is suitably treated with a
30 surfactant, preferably a non-ionic surfactant, to provide for more rapid fluid penetration while retaining improved wetback and fluid retention characteristics. Preferably only discrete spaced areas of the top sheet are coated, for example by spraying,
35 such as the central area or the top sheet is line printed or spot printed.

The invention may be put into practice in various ways and three specific embodiments will now be described by way of example with reference to the
40 accompanying drawings, in which:-

Figure 1 is a perspective view of a diaper constructed in accordance with the present invention with parts thereof broken away illustrating details of construction;

50 *Figure 2* is a vertical sectional detail view looking along the plane of line 2-2 in figure 1;

Figure 3 is a schematic elevational view of a diaper;

Figure 4a is a partial plan view of one embodiment of a disposable diaper having line printed surfactant on the top sheet thereof;

Figure 4b is a partial plan view of one embodiment of a diaper which has surfactant printed in discrete spaced areas thereon, and

60 *Figure 5* is a plan view of a preferred embodiment wherein the central portion of the top sheet is line printed with surfactant in spaced discrete areas.

In the accompanying drawings, all like reference numerals designate similar parts throughout the
65 various views. Figure 1 shows a diaper 10 which

includes a bottom sheet 12 of water impervious plastic film material (which may be embossed or matte finished) having mounted thereon a pad 14 formed of an absorbent core, which may have one or
70 more layers of wadding. The top sheet 16 is made of non-woven hydrophobic material, such as polypropylene, polyamide or polyester fibres or mixtures thereof. The topsheet is conventional and may be spun-bonded, dry or wet-laid and may be chemically or thermally bonded.

In accordance with the concepts of the present invention, to top sheet is treated as shown in Figure 1 at 18 with 0.1 to 0.6% by weight of a surfactant capable of altering the hydrophobic properties of the
75 material on the top surface of the top sheet. The surfactant is preferably non-ionic and more preferably an ethoxylate of (1) a C₁₂ to C₂₀ alcohol (e.g. made from 5-20 moles of ethylene oxide per mole of alcohol) or (2) a C₆ to C₁₀ alkyl phenol (e.g. made
80 from 5-30 moles of ethylene oxide per mole of phenol). A preferred non-ionic compound is "Triton X-100" (10 moles ethylene oxide condensed with 1 mole of octyl phenol).

The surfactant may be sprayed or surface printed or conventional dip and roller coating may be used. Figure 3 shows the surfactant applied only to the central area, as at 20, of the top sheet 16.

As shown in Figure 4a, the surfactant may be line printed as at 22. Alternatively, the surfactant may be spot printed as at 24 in Figure 4b in discrete areas at spaced intervals. In a preferred embodiment, as shown in Figure 5, the surfactant is line printed at 26 in spaced intervals on each line with the printed areas in each line being staggered. Only the central portion of the top sheet is shown provided with the printed coating of surfactant. Alternatively, the entire surface may be so treated.

A particularly preferred line treatment is one wherein the lines 22, instead of being parallel to the sides of the diaper, are arranged diagonally (e.g. at an angle of from 30 to 60° with the diaper edge). In a further embodiment the lines shown in Figure 4a are rotated through 90°.

When the disposable product is in use fluid penetration is enhanced by the surfactant treated areas of the non-woven hydrophobic material. However, little change of the desired fluid wetback and fluid retention characteristics are evident. In the preferred top surface treatment, the surfactant does not penetrate fully through the material, but only serves to initially guide the fluid material to penetrate the non-woven hydrophobic material, and this further limits wetback.

The treated top sheets of the present invention have a penetration factor of at least 80 and a wetback factor of no greater than 10. These factors represent the percent of fluid which passes through the sheet in a standard period of time and the percent which "wetsback". In the test procedures 30 cc of fluid were used. If all the fluid passes through the sheet with no "roll off" the penetration factor is 100. If half rolls off then the factor is 50. Similarly if 15 cc of fluid wetback in the described procedure the factor is 50. Obviously, the higher the penetration factor and the
120 lower the wetback factor the more effective is the
130

product.

The test by which the penetration factor and the wetback factor are measured is as follows:

- 5 The diaper is held on a flat surface at 5° to the horizontal and 30 ccs of water is poured slowly over a period of 30 seconds onto the top end of the top sheet so as to flow over the top surface. Any liquid not absorbed flows off the bottom end and is collected and measured. The penetration factor is
10 the proportion of the 30 ccs absorbed by the diaper expressed as a percentage.

- The diaper is then lowered to a horizontal position and allowed to stand for 15 minutes. A 7 kg load is applied over an area of 15 sq. inches around the
15 centre of the top surface of the diaper for 2 minutes and the load then removed. Sufficient weighed sheets of filter paper are then placed over the top surface of the diaper to absorb all the liquids contained therein.

- 20 Typically 4 to 5 sheets of filter paper are used weighing 1 to 2 grams.

The 7 kg load is then reapplied for 1 minute and then removed.

- 25 The wetted filter paper is removed and weighed to determine the amount of liquids which wetback through the top sheet under these load conditions.

The wetback factor is the proportion of the absorbed liquids which wet back into the filter paper and are absorbed thereby, expressed as a percentage.

- 30 CLAIMS

1. A disposable product comprising an air permeable top sheet containing a major amount of
35 non-woven hydrophobic fibres, from 0.1 to 0.6% by weight of a surfactant being applied to the said top sheet to facilitate fluid passage therethrough, the said top sheet having a maximum wetback factor of 10, and a penetration factor of at least 80.

- 40 2. A disposable product as claimed in claim 1, in which the surfactant is applied to spaced discrete areas of the top sheet.

3. A disposable product as claimed in claim 1 or 2, in which surfactant is applied in lines to the top
45 sheet.

4. A disposable product as claimed in claim 1 or 2, in which the surfactant is applied in spots to the top sheet.

5. A disposable product as claimed in claim 1, 2,
50 3 or 4, in which the surfactant is applied only to the central area of the top sheet.

6. A disposable product as claimed in any one of claims 1 to 5, in which the surfactant is non-ionic.

7. A disposable product as claimed in any one of
55 claims 1 to 6, in which the top sheet is substantially uniformly impregnated with surfactant.

8. A disposable product as claimed in any one of claims 1 to 7 in the form of a disposable diaper.

9. A disposable product as claimed in any one of
60 the preceding claims substantially as specifically described with reference to any one of the accompanying drawings.